

**MODEL SOSIAL EKONOMI SUMBER DAYA KERANG DI TAMAN  
NASIONAL SEMBILANG KABUPATEN BANYUASIN SUMATERA  
SELATAN**

***SOCIOECONOMIC MODEL OF SHELLFISH RESOURCES IN SEMBILANG  
NATIONAL PARK BANYUASIN REGENCY SOUTH SUMATRA***

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**ABSTRAK**

Kawasan Taman Nasional Sembilang memiliki sumberdaya kerang darah (*Anadara granosa*). Penangkapan kerang darah dilakukan dengan tradisional yaitu menggunakan tangan pada saat air surut. Untuk menjaga sumberdaya kerang diperlukan analisis perhitungan faktor yang mempengaruhi hasil tangkapan secara sosioekonomi. Tujuan penelitian ini menghitung dan menganalisis faktor yang mempengaruhi dan menentukan model terbaik (*best fit model*) sosioekonomi sumberdaya kerang di Taman Nasional Sembilang. Penelitian ini dilaksanakan pada bulan Februari 2022 di perairan Taman Nasional Sembilang. Penentuan jumlah responden dan pengumpulan data pada penelitian ini menggunakan metode *accidental sampling* dan pengumpulan data dilakukan dengan wawancara menggunakan kuisioner. Pengujian asumsi model meliputi uji normalitas, uji linearitas, uji multikolinearitas, uji heterokedastisitas dan uji autokorelasi. Model terbaik (*best fit model*) menggunakan pendekatan persamaan regresi linear berganda dengan metode *backward analysis regression* yaitu  $Y = -1456.315 + 0.116X_1 + 1.514 X_2 + 2.547 X_3 - 12.558 X_7 + \epsilon$ . Faktor yang mempengaruhi jumlah hasil tangkapan sumberdaya kerang di Taman Nasional Sembilang Kabupaten Banyuasin yaitu harga jual kerang, biaya operasi, pendapatan dan jumlah tanggungan.

Kata kunci: Sumberdaya kerang, model, Taman Nasional Sembilang, Sosioekonomi.

## ABSTRACT

*The Sembilang National Park area has blood cockle (*Anadara granosa*) resources. Catching blood cockles is done traditionally, namely using hands at low tide. To maintain shellfish resources, it is necessary to analyze the factors that influence socioeconomic catches. The aim of this research is to calculate and analyze the factors that influence and determine the best socio-economic model for shellfish resources in Sembilang National Park. This research was carried out in February 2022 in the waters of Sembilang National Park. Determining the number of respondents and collecting data in this study used the incidental sampling method and data collection was carried out by interviews using questionnaires. Model assumption testing includes normality test, linearity test, multicollinearity test, heteroscedasticity test and autocorrelation test. Best fit model uses a multiple linear regression equation approach with the backward analysis regression method, namely  $Y = -1456.315 + 0.116X_1 + 1.514 X_2 + 2.547 X_3 - 12.558 X_7 + \varepsilon$ . Factors that influence the number of catches of shellfish resources in Sembilang National Park, Banyuasin Regency are the selling price of shellfish, operating costs, income and number of dependents.*

*Keywords: Shellfish resources, best fit model, Sembilang National Park, Socioeconomics.*

## 1. INTRODUCTION

Taman Nasional Sembilang (TNS) is one of the nature conservation areas that has an area of 267,592.42 ha which is the largest mangrove forest in Western of Indonesia (Berbak Sembilang National Park Agency, 2020). Mangrove ecosystems provide direct and indirect benefits to the community. TNS is an area rich in biota diversity, especially fisheries (Fauziyah et al., 2012; Agustriani et al., 2020; Fauziyah et al., 2018), and shellfish are a source of protein and income for local communities. *Anadara* species are also good biomonitoring species for ecosystem quality in the intertidal zone because it have hemocytes, erythrocytes and ganulocytes (Kim et al., 2020). All commercially important *Anadara* species are essentially inhabitants of

soft substrates or mud (M.J.Broom, 1985).

The fishing gear used to collect clams generally uses dredge gear (Puspito, 2012). Dredge gear is a productive tool for catching clams, but it is not selective, which can damage clam resources and ecosystems (Puspito, 2013). Clam fishing in the TNS area uses traditional methods. The time of operation for clam collection is during low tide conditions. In addition, the use of scratching is prohibited by the conservation area manager because it can damage the ecosystem. Management of captured resources must be done properly because fishery resources are very important for human needs (Uktolseja, 2022).

Catches are affected by several factors, including socioeconomic factors such as selling price of catches, operating costs, income, operating trips,

age, business experience, number of family dependents and education. Variables included in the economic factor category are the selling price of the catch, operating costs and income. Variables included in social factors are age, education (Prayoga, 2010), business experience and number of family members (Yasin et al., 2014). These factors do not necessarily produce optimal productivity so it is necessary to model the combination of production factors to achieve optimization of catch resources.

Determination of the regression model is carried out with a linear regression equation with the backward analysis regression method. This method is a backward step procedure that starts with a model containing all independent variables and then identifies the independent variables with the smallest F value for regression

to be excluded from the model (Wohon et al., 2017). This study determines the variables that are significant and most influential on mussel productivity from socioeconomic factors.

The purpose of this study is to analyze the factors that influenced the socioeconomics of shellfish resources and determine the best fit model for the socioeconomics of shellfish resources in Sembilang National Park.

## 2. MATERIALS AND METHODS

### Time and Research Location

This research was conducted in February 2022, in Sembilang National Park, Banyuasin Regency, South Sumatra. The mussel collection areas were Sembilang River, Tengkorak River, Kelapa Bay, Sei Tirim, P Cabe, Nibung River, Alangan Bundar, Sei Buaya, Sei Siapo Besar, P Besar, and Sei Ngirawan.



Figure 1. Shellfish Catchment Area Interview Results

### Research Method

Respondents who became samples in this study were Kerang Darah fishermen in Sungsang village and Sembilang village of TNS. The number of samples in

this study is 85 respondents with the number of respondents in Sembilang village of TNS was 45 respondents and in Sungsang village was 40 respondents. The sampling technique used in this

study was accidental sampling. The method of collecting samples as the object of research was carried out in a structured and direct interview using a list of questions that had been prepared beforehand with questions concerning the socioeconomics of shellfish resources.

## Data Analysis

### Parameters Affecting the Model

The data analysis procedure performed was an assessment of fishing gear productivity using the principle of ratio analysis. This method focuses on changes in the flow of economic functions that impact the productivity of the natural resources being assessed (Ruban et al., 2021). The productivity of the scallop fishing unit was analyzed using a multiple linear regression approach, as follows:

$$Y = \alpha + X_1\beta^1 + X_2\beta^2 + X_3\beta^3 + X_4\beta^4 + X_5\beta^5 + X_6\beta^6 + X_7\beta^7 + X_8\beta^8$$

Description:

$Y$  = Catch Rate (Production),  $X_1$  = Selling price of shellfish harvested (Rp/kg),  $X_2$  = Operational cost (Rp),  $X_3$  = Income (Rp/kg),  $X_4$  = Operational Trip,  $X_5$  = age (yearold),  $X_6$  = Business experience (year),  $X_7$  = Number of family responsibilities (person),  $X_8$  = Education,  $\alpha$  = Constanta, dan  $\beta^1, \beta^2, \beta^3, \beta^4, \beta^5, \beta^6, \beta^7, \beta^8$  = Regression coefficients.

Calculation of the effect of independent variables on the dependent variable is the F test. where if F count  $\leq$  F table, then accept  $H_0$  and if F count  $>$  F

table, then reject  $H_0$ . Then, multiple regression analysis is carried out.

### Classical Assumption Test

The classical assumption test is carried out to obtain good and efficient regression results. The classical assumption test consists of several processes, namely normality test, linearity test, multicollinearity test, heteroscedasticity test, and autocorrelation test (Ghozali, 2014).

### Best Fit Model

The selection of the best fit model is conducted using The Backward Elimination Procedure method for the least variable selection procedure that will be excluded to become the best model (Wohon et al., 2017). The eliminated independent variable is based on the smallest  $F_{\text{partial}}$  value and is also determined by the  $F_{\text{table}}$  value. The Backward Elimination Procedure method explains the behavior of the dependent variable by selecting the independent variable from all the independent variables available in the data.

## 3. RESULTS AND DISCUSSION

The TNS area is a mangrove forest that provides economic benefits to the local community. Generally, the community groups work as fishermen, farmers, and marine fisheries cultivators. The TNS area is located in Banyuasin waters, which generally have muddy or clay substrates (Pratama et al., 2020; Fauziyah et al., 2019) and is a fishing ground for shellfish biota. The

type of clam that is commonly found and caught by fishermen is kerang darah (*Anadara granosa*).

**Shellfishing Methods in the Taman Nasional Sembilang**

Shellfishing in the Taman Nasional Sembilang is done manually. Catching clams using garuk in the Taman Nasional Sembilang is restricted due to the fact that it can damage the clam resource ecosystem. Garuk is a productive fishing tool for catching shellfish but is not selective so that it can damage the shellfish ecosystem (Puspito, 2013). The dredge gear has a major impact on benthic communities including demersal fish, molluscs and crustaceans (Watson et al., 2006). The method used for collecting shellfish is by walking along the beach area at low tide and the shellfish obtained are put into sacks. Clam collection is carried out when the water is low so that fishermen can directly reach the substrate by hand to collect clams. Clam collection is carried out when it is not fish season so that fishermen look for other alternatives to meet their daily needs.

The fishermen use boats with length (L) 12-14 m, width (B) 1.5-2.5 m, and height (D) 1.2-1.7 m with gross tonnage ranging from 2-5 GT. The engine drives used are engine power between 24-28 PK and the engine brands used consist of a variety of

Mitsubishi, Toyama, Yangdong, and Shanghai. The fuel used is diesel. Shellfish fishermen who take shellfish from TNS not only come from within the area but also from outside the area that is Sungsang village.

**Seasons and Shellfish Fishing Areas**

The clam fishing season in the Taman Nasional Sembilang is carried out in one fishing period of 5 months/year. The clam fishing season is divided into 3 seasons, that are peak season, medium season and panceklik season. Based on the results of interviews conducted with scallop fishermen, medium season catches occur in March-April and peak season catches occur in May and June, at the end of June there is a decrease in catches to the medium season and the panceklik season occurs in July. In the clam fishing season, fishermen make 4 fishing trips a month or 1 trip a week with low tide.

**Socioeconomics of Shellfish Resources**

The shellfish harvest in the Taman Nasional Sembilang in this study was influenced by two factors, that are economic factors and social factors. Economic factors are the selling price of shellfish, operating costs, income, operating trips. Social factors are age, number of dependents, business experience and education.

Table 1. Socioeconomics of Shellfish Resources Factors

No	Variables	Min	Max	Mean	Modus
1.	Shellfish Price (Rp)	Rp.16.000	Rp.16.333	Rp.16.278	Rp.16.333
2.	Operationan Costs (Rp)	Rp.1.800.000	Rp.8.220.000	Rp.3.284.459	Rp.224.000
3.	Incomes (Rp)	Rp.4.880.000	Rp.16.340.000	Rp.8.715.600	Rp.8.000.000

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No	Variables	Min	Max	Mean	Modus
4.	Operational Trips (Trips)	16	22	19	20
5.	Ages (years old)	21	62	44	45
6.	Business experience (Years)	10	49	28	25
7.	Number of family responsibilities (Persons)	2	6	4	3
8.	Education	Uneducated (1)	SMP (3)	SD (2)	2

Based on the results of interviews with clam fishermen in Sembilang and Sungsang villages, the average price of clams is Rp. 16,000/kg with a percentage of 16% and 84%. The cost of catching clams requires Rp.2,000,000-Rp.4,000,000 with a percentage of 81%. Fishermen's income from collecting clams ranged from Rp.7000,000-10,000,000 with a percentage of 40%. The highest operating trip is 20 trips. Age of scallop fishermen ranged from 26-45 years old. The experience of scallop fishermen ranges from 10-50 years with the highest percentage ranging from 41-50 years with a percentage of 53%. The average number of dependents is 4 people, which is 38% Education is elementary school, junior high school and not in school. The highest number in education is elementary school with a percentage of 68%.

The price of scallops depends on the season. High clam prices occur when clams are in the lean season and low clam prices occur when clam catches are high. The operating costs required by scallop fishermen in catching scallops are supplies, sacks and boat wages, fuel and boat maintenance costs. The income received by scallop fishermen is influenced by the revenue and costs

used. The costs used are fixed costs and variable costs. The number of trips will affect the catch of scallop fishermen in TNS, that are the higher the number of trips, the catch will increase, while the lower the number of trips, the catch is decreasing.

The age of fishermen in this research is still at a productive age with an average of 44 years. The age of fishermen has an influence on the level of catch, namely labor productivity. The productive age of fishermen can affect the physical ability to work optimally. The young fishermen are more able to accept innovations and new things so that scallop fishermen in TNS tend to be in a younger age range. Respondents' experience for scallop fishermen is highest at 49 years and lowest at 10 years with an average experience of 28 years. This shows that scallop fishermen are quite experienced. Experience can give a person the ability to make rational decisions.

The average number of dependents of scallop fishermen is 4 people. The number of dependents of fishermen can affect the catch. Elementary education became the most respondents, this happened because the level of education in Sembilang village is elementary school (SD) and low

awareness of education and economic needs is the reason for not continuing to the next level. Meanwhile, higher education will be more open to receiving technological changes and information about resource management (Kusnadi et al., n.d.).

### Socioeconomics of Shellfish Resources Factors

The results of the analysis using SPSS were carried out to determine the factors affecting the productivity of shellfish catches in the clam season.

Table 2. R-square value of Regression analysis results

#### Model Summary<sup>b</sup>

Model	R	R-Square	Adjusted R-Square	Std. Error of the Estimate	Durbin-Watson
1	0.880 <sup>a</sup>	0.774	0.750	57.56844	2.035

The R-square obtained is 0.774, which means that 77.40% of the eight independent variables, namely the selling price of caught fish, income, operating costs, operating trips, age, business experience, number of family

dependents and education can explain the dependent variable total catch and the remaining 22.6% can be explained by other variables outside of this study.

Table 3. Anova Result of F Test Calculation

	Model	Sum of Squares	df	Mean Square	F	Sig.
1	<i>Regression</i>	862898.802	8	107862.350	32.546	.000b
	<i>Residual</i>	251873.551	76	3314.126		
	<i>Total</i>	1114772.353	84			

The F test is conducted to determine the effect of the independent variable on the dependent variable. From the  $F_{hitung}$  test value in Table 5, it is 32.546 and the  $F_{tabel}$  value is 2.06. The results of management using SPSS obtained the conclusion  $F_{hitung} > F_{tabel}$  then reject  $H_0$  and  $H_a$  is accepted, which means that there is a

relationship between the independent variable and the dependent variable. The significance value of the regression model is significant because the significance value is  $< 0.05$  and the significant value in Table 4 is 0.000.

### Classical Assumption Test

Table 4. Classical Assumption Test Result

No.	Statistic Analysis	Test Parameter Values	Information
1	Normality	Asymp. Sig 0,05	Not normally distributed

2.	Linearity	Sig > 0,05	Linear
3.	Multicollinearity	VIF < 10 dan a >1	Multicollinearity does not occur
4.	Heteroscedasticity	The points on the Scatter plot graph spread above and below zero on the Y axis and do not form a particular pattern	Heteroscedasticity does not occur
5.	Autocorrelation	Durbin Watson $du < d < 4-du$	There is no autocorrelation

**Linear Regression Equations of Best Fit Model**

The selection of an equation model of the estimator that is considered safe from violations of classical assumptions is good if it has gone through stages such as multicollinearity test, autocorrelation test, and heteroscedacity test. The selection of the best model is then carried out using The Backward Elimination Procedure method using

SPSS for the procedure of selecting the smallest variable that will be excluded to become the best model (Wohon et al., 2017). The selection of models carried out with SPSS calculations then obtained five models from eight independent variables, namely average price, operating costs, income, operating trips, age, business experience, number of dependents, and education and the dependent variable is the total catch.

Table 5. Classical Assumption Regression Equation

Variable	UM (VIF<5)	Inf	UH (Scatter-plot)	UA (-2<DW<2)	Inf	R <sup>2</sup> (%)	Sig <0,05	Inf
(X <sub>1</sub> )	1.146	M	TMP	2.019	M	74,20	0.043	S
(X <sub>2</sub> )	1.522	M	TMP	2.019	M	74,20	0.010	S
(X <sub>3</sub> )	1.626	M	TMP	2.019	M	74,20	0.000	S
(X <sub>7</sub> )	1.077	M	TMP	2.019	M	74,20	0.049	S

Ket: UM = Multicollinearity Test      X<sub>1</sub> = average price  
UH = Heteroscedasticity Test      X<sub>2</sub> = Operational costs  
UA = Autocorrelation Test      X<sub>3</sub> = Incomes  
M = Fulfill      X<sub>7</sub> = Number of dependents  
TMP = Does Not Form a Pattern  
S = Significant  
TS = Not Significant  
TM = Does Not fulfill

$$Y = -1456.315 + 0.116X_1 + 1.514 X_2 + 2.547 X_3 - 12.558 X_7 + \varepsilon$$



The constant value is negative, amounting to 1456.315, which means it shows the opposite effect between the independent variable and the dependent variable. The variable  $X_1$ ,  $X_2$ ,  $X_3$ ,  $X_7$  has a change of -1456.315. The regression coefficient  $X_1$  (average price) is 0.116, it can be concluded that the average price variable has a significant effect and if the price is increased it will contribute to an increase in the number of catches by 0.116 kg. (Ridha, 2017) in previous research stated that selling price is a factor that affects the catch in Idi Rayeuk District.

The regression coefficient ( $X_2$ ) of operating costs of 1.514 can be concluded that the operating cost variable has a significant effect if it is increased, it will have an effect on catches of 1.514 kg. (Dewi et al., 2020; Halim and Susilo, 2013) in their research said that operating costs are a factor that affects catches. Operating costs can affect catches where if operating costs increase, catches also increase by expanding the clam fishing area. The operating costs used by fishermen in TNS are fuel, supplies, sacks, boat repairs and boat wages.

The regression coefficient  $X_3$  (income) is 2,547, it can be concluded that the income variable has a significant effect and if income is increased it will contribute to an increase in the number of catches of 2,547 kg. The amount of income is related to operating costs, which if operating costs increase, income and catch will increase. (Konoralma et al., 2020) in their research stated that fishermen's income

can affect catches. The regression coefficient  $X_7$  (number of dependents) is -12.558, it can be concluded that the variable number of dependents has a significant effect and if the number of dependents decreases it will increase the number of catches by 12.558 kg. The number of dependents can decrease or decrease if the family is of marriageable age so that it can affect the catch.

#### 4. CONCLUSIONS

Best fit socioeconomic model of shellfish resources in the Taman Nasional Sembilang, Banyuasin Regency, South Sumatra obtained the best model equation at  $Y = -1456.315 + 0.116X_1 + 1.514 X_2 + 2.547X_3 - 12.558 X_7 + \epsilon$ , and influential variables consist of economic factors are average prices, operating costs, income and social factors are the number of dependents.

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